Claims:

1. A method of forming a metal product, comprising the steps of: providing a metal alloy workpiece substrate have pre-process dimensions; determining dimensional differences between the pre-process dimensions of the workpiece substrate and desired post-process dimensions of a post-process metal product formed from the workpiece substrate; determining a build-up thickness of coating material required to obtain the desired post-process dimensions of the post-process metal product; performing a high-density coating process to coat the workpiece substrate with a coating material to build-up a thickness of coating material effective to obtain desired finished dimensions after performing a sintering heat treatment process and a hot isostatic pressing treatment; performing the sintering heat treatment on the coated workpiece substrate to densify the coating material; and then performing the hot isostatic pressing treatment to obtain the post-process metal product having the desired post-process dimensions and having diffusion bonding between the coating material and the workpiece substrate.

2) A method of forming a metal product according to claim 1; wherein the metal alloy workpiece substrate comprises a nickel or cobalt-base superalloy; and the step of performing the high-density coating process comprises performing a high-density coating process such as a hyper velocity oxy-fuel thermal spray process or a detonation gun

process to apply a high-density coating having the same nickel or cobalt-base superalloy composition as the metal alloy workpiece substrate.

3) A method of forming a metal product according to claim 2; wherein the step of performing the sintering heat treatment comprises sintering at a temperature at or about 1825 to 2150 degrees F for about 1/2 to 2 hours.

4) A method of forming a metal product according to claim 2; wherein the step of performing the hot isostatic pressing treatment comprises hot isostatic pressing at a temperature of about 2200F in about 15 KSI argon for about 4 hours.

5) A method of forming a metal product according to claim 1; wherein the step of hot isostatic pressing treatment comprises the step of heating the coated workpiece substrate to a temperature that is substantially 80% of the melting point of the metal alloy; and pressurizing the coated workpiece substrate to a pressure substantially between 20 and 50 percent of the yield strength of the metal alloy in an inert gas atmosphere.

6) A method of forming a metal product according to claim 1; wherein the coating material built-up during the high-density coating process is comprised of the same metal alloy as the workpiece substrate.

7) A method of forming a metal product according to claim 6; wherein the step of performing the sintering heat treatment comprises sintering at a temperature at or about 1825 to 2150 degrees F for about 1/2 to 2 hours.

8) A method of forming a metal product according to claim 7; wherein the step of performing the hot isostatic pressing treatment comprises hot isostatic pressing at a temperature of about 2200F in about 15 KSI argon for about 4 hours.

9) A method of forming a metal product, comprising the steps of: selecting attributes of a final workpiece product; determining an appropriate substrate composition depending on the selected attributes; forming a workpiece substrate to near-finished dimensions; determining an appropriate coating material composition depending on the selected attributes; preparing the workpiece substrate for a high-density coating process; performing the high-density coating process to coat the workpiece substrate with the coating material to a thickness effective to obtain desired finished dimensions after

performing a hot isostatic pressing treatment; determining appropriate hot isostatic pressing treatment parameters; and performing the hot isostatic pressing treatment on the coated workpiece substrate to obtain a metal product having the desired finished dimensions and diffusion bonding between the coating material and the workpiece substrate.

10) A method of forming a metal product according to claim 9; wherein the step of performing the high-density coating process comprises performing a hyper velocity oxy-fuel thermal spray process.

11) A method of forming a metal product according to claim 10; wherein the step of hot isostatic pressing treating comprises the step of heating the engine part to a temperature that is substantially 80% of the melting point of the metal alloy; and pressurizing the engine part to a pressure substantially between 20 and 50 percent of the yield strength of the metal alloy in an inert gas atmosphere.

12) A method of forming a metal product according to claim 11; wherein the step of performing the hot isostatic pressing treatment comprises hot isostatic pressing at a temperature of about 2200F in about 15 KSI argon for about 4 hours.

13) A method of forming a metal product according to claim 9; further comprising the step of performing a sintering heat treatment on the coated workpiece substrate to densify the coating material before performing the hot isostatic pressing treatment.

14) A method of forming a metal product according to claim 13; wherein the step of performing the sintering heat treatment comprises sintering at a temperature at or about 1825 to 2150 degrees F for about 1/2 to 2 hours.

15) A method of forming a metal product according to claim 9; wherein the workpiece substrate comprises a nickel or cobalt-base superalloy; and the step of performing the high-density coating process comprises performing a high-density coating process such as a hyper velocity oxy-fuel thermal spray process or a detonation gun process to apply a high-density coating having the same nickel or cobalt-base superalloy composition as the workpiece substrate.

16) A method of forming a metal product according to claim 9; wherein the coating material built-up during the high-density coating process is comprised of a same metal alloy as the workpiece substrate.

17) A method of forming a metal product having a wear resistant surface, comprising the steps of: providing a workpiece substrate to near-finished dimensions; performing a high-density coating process to coat the workpiece substrate with a wear resistant coating material to a thickness effective to obtain desired finished dimensions after performing a hot isostatic pressing treatment; and performing a hot isostatic pressing treatment on the coated workpiece substrate to obtain a metal product having the desired finished dimensions and diffusion bonding between the coating material and the workpiece substrate.

18) A method of forming a metal product according to claim 17; wherein the step of performing the high-density coating process comprises performing a hyper velocity oxy-fuel thermal spray process.

19) A method of forming a metal product according to claim 18; wherein the step of hot isostatic pressing treating comprises the step of heating the engine part to a temperature that is substantially 80% of the melting point of the metal alloy; and pressurizing the engine part to a pressure substantially between 20 and 50 percent of the yield strength of the metal alloy in an inert gas atmosphere.

20) A method of forming a metal product according to claim 19; further comprising the step of performing a sintering heat treatment on the coated workpiece substrate to densify the coating material before performing the hot isostatic pressing treatment.

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